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EDITORIAL

GEOLOGISTS heartily participate in the satisfaction which astronomers justly feel over the great mass of accurate data which favorable conditions and their own zeal and skill enabled them to gather from the recent solar eclipse. Geologists offer their cordial felicitations not only as fellow scientists rejoicing in the common advancement of science for its own sake, and for its influence on the world, but because they are themselves concerned in the solution of the solar problems. Especially are they interested in those questions of the sun's constitution and internal activities which bear upon his sources of heat, present, past, and future; for these vitally touch the limitations of geologic history. It is impossible, therefore, for historical geologists to be indifferent to the results of any investigation that promises to throw light upon the thermal endurance of the sun.

The central subject of interest in the recent observations, the constitution of the corona, may seem quite remote from any geologic relationship, but, as in so many other cases in the history of science, light upon dark problems may come from an unexpected source. It is not beyond the limits of speculation to conceive that the corona may prove to be the very phenomenon that will point the way to a revised estimate of the thermal possibilities of the sun and thus to a revised measure of its past duration and of the age of the earth as one of its dependencies. Some hint of the possibilities may be found in the logical sequences of one of the alternative working hypotheses relative to the coronal nature. If the conception that it is formed of extremely attenuated matter driven away at great velocities, after the analogy of the tails of comets, should be substantiated, it will necessarily be followed by the problem of the origin of such attenuated matter. In the case of comets such supposed matter may be assumed to be simply an accessory constituent brought in from distant space and developed by approach to the sun — and soon exhausted in the case of captured comets — but such a

hypothesis does not seem well fitted to the sun itself in this late stage of its history. The alternative conjecture that the attenuated form of matter is developed in the sun by the extraordinary agencies operative there must obviously be entertained until disproved, and the recent investigations of J. J. Thompson and others with reference to the extremely attenuated ionization of terrestrial gases under certain conditions render such a hypothesis less highly improbable than it would have seemed under the dominance of the inherited doctrine of the indivisibility of the atom.

A speculation which involves the notion of the divisibility of the atom involves also that of the divisibility of the internal energies of the atom and their possible transformation into radiant energy, and hence a possible source of heat of unknown and, at present, quite incalculable amount.

So too, a speculation which assumes that the corona is radiated matter involves also the conception of loss of sun's substance if the velocity of radiation be as high as that attributed to the conjectural matter of comets' tails; and if this loss of matter in the course of great secular periods becomes appreciable, it may require a reconsideration of the data upon which estimates of the sun's heat are based and also of a revised consideration of the former distances of the planets.

Now such an attenuated chain of hypotheses, each dependent on an antecedent hypothesis of uncertain verity, may be altogether too unsubstantial to have any appreciable value of the positive sort, other than as the antecedent of investigation, but it may have the negative virtue of helping to keep open the question of the sum total of the sources of the sun's heat and its possible duration in the past and the future. And so possibly may also the logical sequences of the alternative coronal hypotheses. The Helmholtzian theory assigns a source of heat of such competency that it cannot be proved not to be the sole essential cause by any measurements of the sun that can be made now, or probably in the near future, and hence it satisfies the immediate demands of astronomical science, however inadequate it may be to meet the natural interpretations of geological and biological data;

but it may be conjectured that when the history of the stellar system shall become as serious and substantial a subject of study as the history of the earth now is, astronomers will find at least as great need for long lapses of time and for the secular endurance of thermal states as do the geologists and biologists.

Meanwhile all solar inquiries are subjects of acute interest in common and the achievements of May 28 are matters of heartiest congratulation.

T. C. C.

THE George Huntington Williams Memorial Lectures, inaugurated in 1897 by Sir Archibald Geike, have been continued this year by Professor W. C. Brögger, of the University of Christiania, who delivered at the Johns Hopkins University two lectures on *The Principles of a Genetic Classification of the Igneous Rocks*, and five lectures on *The Late Geological History of Scandinavia*, as shown by changes of level and climate in southern Norway since the close of the glacial epoch. His long and thorough investigation of the igneous rocks of the Christiania region, so varied in character, well preserved and finely exposed, has qualified him to speak with authority upon the subject of their genetic relations, and renders his judgment upon the general problem of the classification of igneous rocks of the first importance. Until the text of these lectures has been published, it will not be in place to discuss the conclusions enunciated by Professor Brögger. The lectures on *The Late Geological History of Scandinavia* were based upon recent field studies of the glacial phenomena of that region. In addition to their special scientific value, they illustrate the remarkable versatility and energy of Professor Brögger, whose substantial contributions to the paleontology and stratigraphy, the mineralogy and petrology of the Christiania region have already awakened the admiration of his fellow workers.

Professor Brögger also delivered his lectures on the *Genetic Classification of Igneous Rocks* at the University of Chicago to an appreciative audience of students and geologists, who assembled from various parts of Illinois and from Michigan, Wisconsin, and Minnesota.

J. P. I.